

Anti-Abrasion Protection with  
Highly Organized Materials

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## ANTI-ABRASION PROTECTION WITH HIGHLY ORGANIZED MATERIALS\*

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### ABSTRACT

Abrasion and impact resistance are a prime requirement for many materials applications. To best protect plastic or metal-based composites from abrasion and impact, a surface coating that is simultaneously very hard and highly yielding is necessary. Both these requirements can be met by a dense pattern of emergent fibers or high L/D ratios, well rooted but with one end free, i.e., hair. A covering of such hair, with fibers long enough to accommodate themselves to impacting objects, will give substantial protection against impact or particle abrasion.

### INTRODUCTION

This project is exploring a new approach for the preparation of high abrasion and impact wear resistant coatings. These coatings are constructed of a high density mat and very fine filaments or "hairs" (high L/D ratios) of hard material, anchored at one end into the surface of the bulk matrix, at vertical or near-vertical angles. The emergent portion of these fibers forms a hair-like mat that resists impact by compression of the mat, i.e., flexure and rearrangement of the hairs, providing a compliance to the impacting particles. Abrasion resistance is provided by the high hardness of the individual filaments. The hair mats are also expected to provide a reduction in the frictional forces at the surface.

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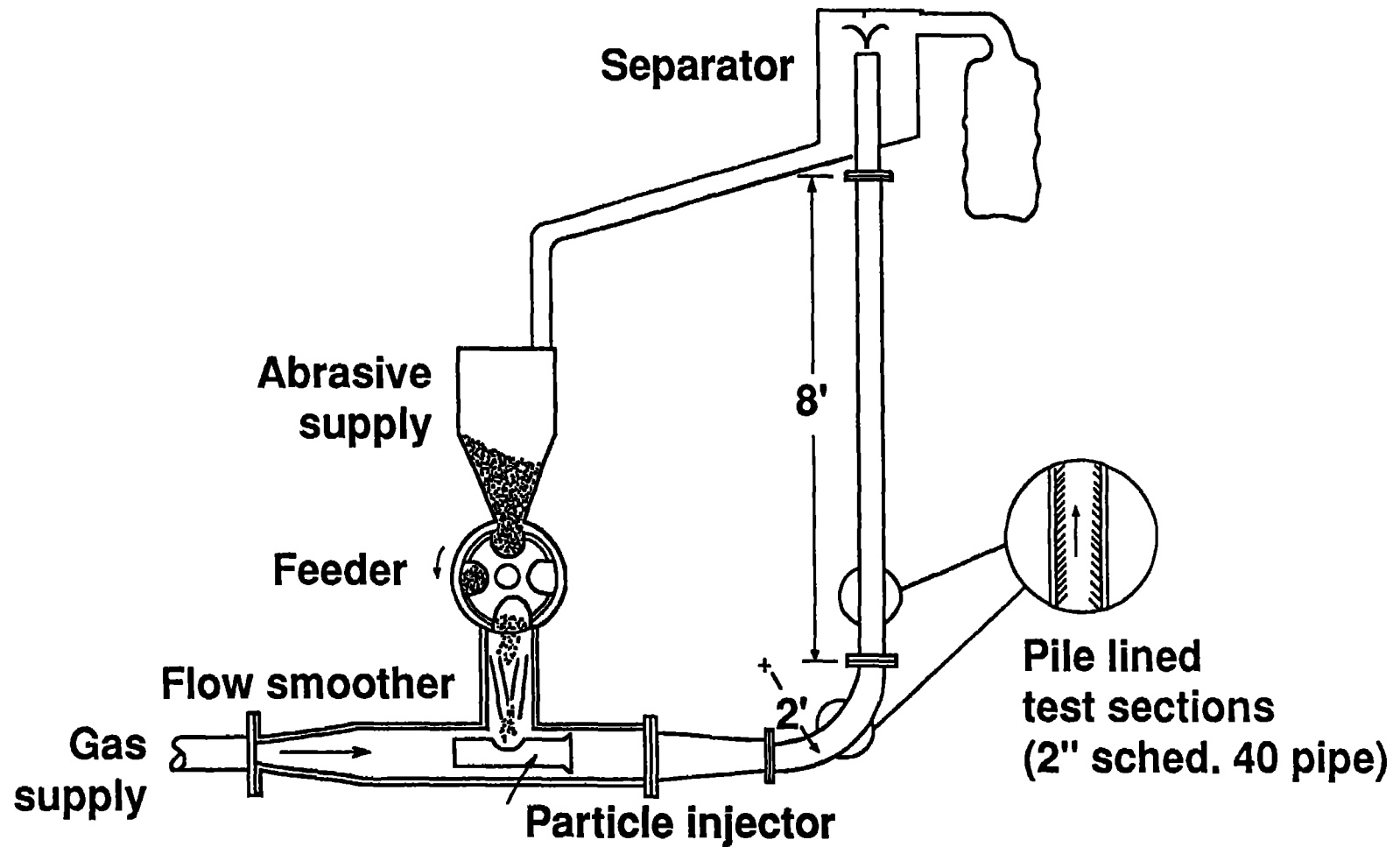
## DISCUSSION OF CURRENT ACTIVITIES

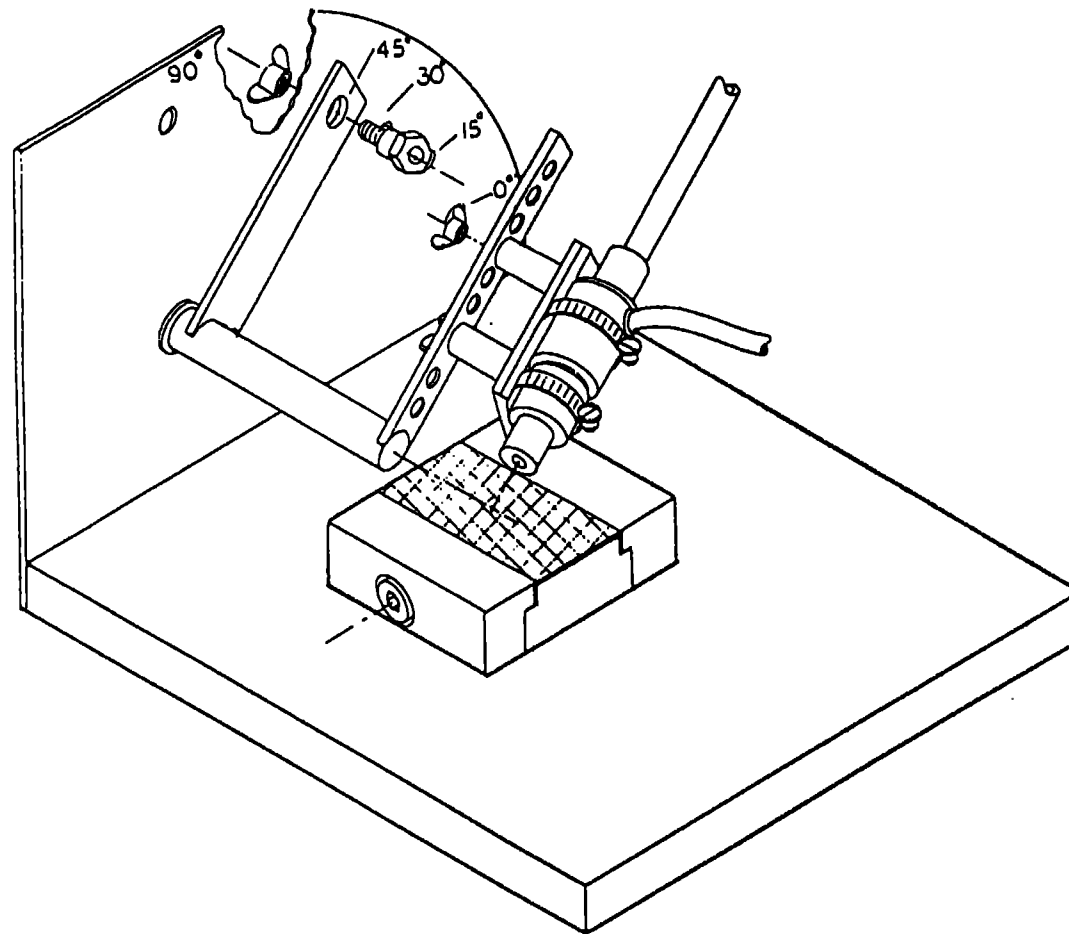
Construction of a new section of the oil shale retort to accommodate the carbon fiber lined PVC pipe has been completed and is presently being calibrated. This new section will have the capability of controlling the flow rate and particle size impacting the test specimen.

A new bench top testing apparatus has also been completed for the characterization of all new material. We are now able to direct the flow at different angles and distances, vary the flow rate, and control the particle size.

The acoustic attenuation properties of the carbon fiber pile are now being tested. A section of fiber lined pipe, using a 1-1/4" to 1-1/2" to 2" diameter, has been fabricated for testing. Acoustic sensors were attached to the piping and water flowed through the piping at various rates. Attenuation was observed in the medium to high frequency range (35 to 50kHz). Further tests will be conducted to extend these ranges to the low to medium frequency ranges (audio frequency).

# **Tribology Field Test Flow System — To measure baseline protective values of flexible pile linings**





Materials Testing Apparatus